

## SEQUENCE LISTING

&lt;110&gt; Novozymes A/S

&lt;120&gt; Pullulanase variants and methods for preparing such variants with predetermined properties

&lt;130&gt; 6072

&lt;160&gt; 40

&lt;170&gt; PatentIn version 3.0

&lt;210&gt; 1

&lt;211&gt; 2766

&lt;212&gt; DNA

&lt;213&gt; Bacillus acidopullulyticus

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)..(2766)

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Asn Tyr Thr Asn Trp Asp Val Trp Met Trp Pro Tyr Gln Pro Val Asn	
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ggt aat gga gca gct tac caa ttc act ggt aca aat gat gat ttt ggc	144
Gly Asn Gly Ala Ala Tyr Gln Phe Thr Gly Thr Asn Asp Asp Phe Gly	
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gct gtt gca gat acg caa gtg cct gga gat aat aca caa gtt ggt ttg	192
Ala Val Ala Asp Thr Gln Val Pro Gly Asp Asn Thr Gln Val Gly Leu	
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att gtt cgt aaa aat gat tgg agc gag aaa aat aca cca aac gat ctc	240
Ile Val Arg Lys Asn Asp Trp Ser Glu Lys Asn Thr Pro Asn Asp Leu	
65 70 75 80	
cat att gac ctt gca aaa ggc cat gaa gta tgg att gta caa ggg gat	288
His Ile Asp Leu Ala Lys Gly His Glu Val Trp Ile Val Gln Gly Asp	
85 90 95	

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Pro	Thr	Ile	Tyr	Tyr	Asn	Leu	Ser	Asp	Ala	Gln	Ala	Ala	Ala	Ile	Pro	
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tct	ggt	tca	aat	gcc	tat	ctt	gat	gat	gaa	aaa	aca	gta	cta	gca	aag	384
Ser	Val	Ser	Asn	Ala	Tyr	Leu	Asp	Asp	Glu	Lys	Thr	Val	Leu	Ala	Lys	
		115					120					125				
cta	agt	atg	ccg	atg	acg	ctg	gcg	gat	gct	gca	agc	ggc	ttt	acg	gtt	432
Leu	Ser	Met	Pro	Met	Thr	Leu	Ala	Asp	Ala	Ala	Ser	Gly	Phe	Thr	Val	
	130					135					140					
ata	gat	aaa	acc	aca	ggg	gaa	aaa	atc	cct	gtc	acc	tct	gct	gta	tcc	480
Ile	Asp	Lys	Thr	Thr	Gly	Glu	Lys	Ile	Pro	Val	Thr	Ser	Ala	Val	Ser	
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Gly	Ala	Ala	Asn	Asn	Trp	Ser	Pro	Asp	Asp	Asp	His	Thr	Leu	Leu	Lys	
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Lys	Ile	Asn	Pro	Asn	Leu	Tyr	Gln	Leu	Ser	Gly	Thr	Leu	Pro	Ala	Gly	
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Thr	Tyr	Gln	Tyr	Lys	Ile	Ala	Leu	Asp	His	Ser	Trp	Asn	Thr	Ser	Tyr	
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Pro	Gly	Asn	Asn	Val	Ser	Leu	Thr	Val	Pro	Gln	Gly	Gly	Glu	Lys	Val	
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acc	ttt	acc	tat	att	cca	tct	acc	aac	cag	gta	ttc	gat	agc	gtc	aat	768
Thr	Phe	Thr	Tyr	Ile	Pro	Ser	Thr	Asn	Gln	Val	Phe	Asp	Ser	Val	Asn	
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Val	Tyr	Ser	Lys	Asp	Ala	Thr	Ser	Phe	Arg	Val	Trp	Ala	Pro	Thr	Ala	
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tcg	aat	gtc	cag	ttg	ctt	tta	tac	aat	agt	gag	aaa	ggg	tca	ata	act	1056
Ser	Asn	Val	Gln	Leu	Leu	Leu	Tyr	Asn	Ser	Glu	Lys	Gly	Ser	Ile	Thr	
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Lys	Gln	Leu	Glu	Met	Gln	Lys	Ser	Asp	Asn	Gly	Thr	Trp	Lys	Leu	Gln	
		355					360					365				

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aat Asn 385	ggg Gly	aca Thr	aca Thr	caa Gln	acg Thr 390	gca Ala	gtt Val	gat Asp	cca Pro	tat Tyr 395	gcg Ala	cgt Arg	gct Ala	att Ile	tct Ser 400	1200
gtc Val	aat Asn	gca Ala	aca Thr	cgc Arg 405	ggt Gly	atg Met	att Ile	gtg Val	gac Asp 410	cta Leu	aaa Lys	gct Ala	acc Thr	gat Asp 415	cct Pro	1248
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gaa Glu	gtg Val	att Ile 435	tat Tyr	gaa Glu	gcg Ala	cat His	gta Val 440	cgc Arg	gat Asp	ttt Phe	tcg Ser	att Ile 445	gat Asp	gct Ala	aat Asn	1344
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aca Thr 465	aaa Lys	gga Gly	ccg Pro	gat Asp	cat His 470	gta Val	aag Lys	aca Thr	ggt Gly	att Ile 475	gat Asp	agt Ser	ttg Leu	aag Lys	gaa Glu 480	1440
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gcc Ala	att Ile	aat Asn	cct Pro	ggt Gly 645	att Ile	gtt Val	tta Leu	tat Tyr	gga Gly 650	gaa Glu	cca Pro	tgg Trp	act Thr	ggc Gly 655	ggc Gly	1968
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gga Gly	tta Leu	gga Gly 675	att Ile	ggc Gly	gtt Val	ttc Phe	aac Asn 680	gat Asp	aat Asn	ata Ile	cgt Arg	aat Asn 685	ggg Gly	ctc Leu	gat Asp	2064
ggg Gly	aac Asn 690	gtg Val	ttt Phe	gat Asp	aaa Lys	acg Thr 695	gca Ala	caa Gln	ggc Gly	ttt Phe	gca Ala 700	aca Thr	gga Gly	gat Asp	cca Pro	2112
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ata Ile	ggt Gly	gag Glu	aaa Lys 900	tca Ser	tta Leu	ggg Gly	cat His	gta Val 905	atg Met	ggt Gly	aat Asn	gtt Val	caa Gln 910	gta Val	ccg Pro	2736

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2766

&lt;210&gt; 2

&lt;211&gt; 921

&lt;212&gt; PRT

&lt;213&gt; Bacillus acidopullulyticus

&lt;400&gt; 2

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Gly Asn Gly Ala Ala Tyr Gln Phe Thr Gly Thr Asn Asp Asp Phe Gly  
           35                  40                  45

Ala Val Ala Asp Thr Gln Val Pro Gly Asp Asn Thr Gln Val Gly Leu  
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Ile Val Arg Lys Asn Asp Trp Ser Glu Lys Asn Thr Pro Asn Asp Leu  
           65                  70                  75                  80

His Ile Asp Leu Ala Lys Gly His Glu Val Trp Ile Val Gln Gly Asp  
           85                  90                  95

Pro Thr Ile Tyr Tyr Asn Leu Ser Asp Ala Gln Ala Ala Ile Pro  
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Ser Val Ser Asn Ala Tyr Leu Asp Asp Glu Lys Thr Val Leu Ala Lys  
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Leu Ser Met Pro Met Thr Leu Ala Asp Ala Ala Ser Gly Phe Thr Val  
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Ile Asp Lys Thr Thr Gly Glu Lys Ile Pro Val Thr Ser Ala Val Ser  
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Ala Asn Pro Val Thr Ala Val Leu Val Gly Asp Leu Gln Gln Ala Leu  
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Gly Ala Ala Asn Asn Trp Ser Pro Asp Asp Asp His Thr Leu Leu Lys  
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Lys Ile Asn Pro Asn Leu Tyr Gln Leu Ser Gly Thr Leu Pro Ala Gly  
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 Pro Gly Asn Asn Val Ser Leu Thr Val Pro Gln Gly Gly Glu Lys Val  
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 Thr Phe Thr Tyr Ile Pro Ser Thr Asn Gln Val Phe Asp Ser Val Asn  
 245 250 255  
 His Pro Asn Gln Ala Phe Pro Thr Ser Ser Ala Gly Val Gln Thr Asn  
 260 265 270  
 Leu Val Gln Leu Thr Leu Ala Ser Ala Pro Asp Val Thr His Asn Leu  
 275 280 285  
 Asp Val Ala Ala Asp Gly Tyr Lys Ala His Asn Ile Leu Pro Arg Asn  
 290 295 300  
 Val Leu Asn Leu Pro Arg Tyr Asp Tyr Ser Gly Asn Asp Leu Gly Asn  
 305 310 315 320  
 Val Tyr Ser Lys Asp Ala Thr Ser Phe Arg Val Trp Ala Pro Thr Ala  
 325 330 335  
 Ser Asn Val Gln Leu Leu Leu Tyr Asn Ser Glu Lys Gly Ser Ile Thr  
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 Lys Gln Leu Glu Met Gln Lys Ser Asp Asn Gly Thr Trp Lys Leu Gln  
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 Val Ser Gly Asn Leu Glu Asn Trp Tyr Tyr Leu Tyr Gln Val Thr Val  
 370 375 380  
 Asn Gly Thr Thr Gln Thr Ala Val Asp Pro Tyr Ala Arg Ala Ile Ser  
 385 390 395 400  
 Val Asn Ala Thr Arg Gly Met Ile Val Asp Leu Lys Ala Thr Asp Pro  
 405 410 415  
 Ala Gly Trp Gln Gly Asp His Glu Gln Thr Pro Ala Asn Pro Val Asp  
 420 425 430  
 Glu Val Ile Tyr Glu Ala His Val Arg Asp Phe Ser Ile Asp Ala Asn  
 435 440 445  
 Ser Gly Met Lys Asn Lys Gly Lys Tyr Leu Ala Phe Thr Glu His Gly  
 450 455 460  
 Thr Lys Gly Pro Asp His Val Lys Thr Gly Ile Asp Ser Leu Lys Glu  
 465 470 475 480

Leu Gly Ile Thr Thr Val Gln Leu Gln Pro Val Glu Glu Phe Asn Ser  
 485 490 495  
 Ile Asp Glu Thr Gln Pro Asp Thr Tyr Asn Trp Gly Tyr Asp Pro Arg  
 500 505 510  
 Asn Tyr Asn Val Pro Glu Gly Ala Tyr Ala Thr Thr Pro Glu Gly Thr  
 515 520 525  
 Ala Arg Ile Thr Glu Leu Lys Gln Leu Ile Gln Ser Leu His Gln Gln  
 530 535 540  
 Arg Ile Gly Val Asn Met Asp Val Val Tyr Asn His Thr Phe Asp Val  
 545 550 555 560  
 Met Val Ser Asp Phe Asp Lys Ile Val Pro Gln Tyr Tyr Tyr Arg Thr  
 565 570 575  
 Asp Ser Asn Gly Asn Tyr Thr Asn Gly Ser Gly Cys Gly Asn Glu Phe  
 580 585 590  
 Ala Thr Glu His Pro Met Ala Gln Lys Phe Val Leu Asp Ser Val Asn  
 595 600 605  
 Tyr Trp Val Asn Glu Tyr His Val Asp Gly Phe Arg Phe Asp Leu Met  
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 625 630 635 640  
 Ala Ile Asn Pro Gly Ile Val Leu Tyr Gly Glu Pro Trp Thr Gly Gly  
 645 650 655  
 Thr Ser Gly Leu Ser Ser Asp Gln Leu Val Thr Lys Gly Gln Gln Lys  
 660 665 670  
 Gly Leu Gly Ile Gly Val Phe Asn Asp Asn Ile Arg Asn Gly Leu Asp  
 675 680 685  
 Gly Asn Val Phe Asp Lys Thr Ala Gln Gly Phe Ala Thr Gly Asp Pro  
 690 695 700  
 Asn Gln Val Asp Val Ile Lys Asn Gly Val Ile Gly Ser Ile Gln Asp  
 705 710 715 720  
 Phe Thr Ser Ala Pro Ser Glu Thr Ile Asn Tyr Val Thr Ser His Asp  
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 740 745 750

Glu Ala Asp Arg Ile Lys Met Asp Glu Leu Ala His Ala Val Val Phe  
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Thr Ser Gln Gly Val Pro Phe Met Gln Gly Gly Glu Glu Met Leu Arg  
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Thr Lys Gly Gly Asn Asp Asn Ser Tyr Asn Ala Gly Asp Ser Val Asn  
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Gln Phe Asp Trp Ser Arg Lys Ala Gln Phe Lys Asp Val Phe Asp Tyr  
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Phe Ser Ser Met Ile His Leu Arg Asn Gln His Pro Ala Phe Arg Met  
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Thr Thr Ala Asp Gln Ile Lys Gln Asn Leu Thr Phe Leu Glu Ser Pro  
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Thr Asn Thr Val Ala Phe Glu Leu Lys Asn Tyr Ala Asn His Asp Thr  
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Trp Lys Asn Ile Ile Val Met Tyr Asn Pro Asn Lys Thr Ser Gln Thr  
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Leu Asn Leu Pro Ser Gly Asp Trp Thr Ile Val Gly Leu Gly Asp Gln  
                           885                          890                          895

Ile Gly Glu Lys Ser Leu Gly His Val Met Gly Asn Val Gln Val Pro  
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Ala Ile Ser Thr Leu Ile Leu Lys Gln  
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<210> 3

<211> 2787

<212> DNA

<213> Bacillus deramificans

<220>

<221> CDS

<222> (1)..(2784)

<400> 3

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48

gat Asp	tat Tyr	caa Gln	cct Pro 20	tgg Trp	agt Ser	cta Leu	tgg Trp	atg Met 25	tgg Trp	cca Pro	aaa Lys	gac Asp	gga Gly 30	ggt Gly	ggg Gly	96
gct Ala	gaa Glu	tac Tyr 35	gat Asp	ttc Phe	aat Asn	caa Gln	ccg Pro 40	gct Ala	gac Asp	tct Ser	ttt Phe	gga Gly 45	gct Ala	ggt Val	gca Ala	144
agt Ser	gct Ala 50	gat Asp	att Ile	cca Pro	gga Gly	aac Asn 55	cca Pro	agt Ser	cag Gln	gta Val	gga Gly 60	att Ile	atc Ile	ggt Val	cgc Arg	192
act Thr 65	caa Gln	gat Asp	tgg Trp	acc Thr	aaa Lys 70	gat Asp	gtg Val	agc Ser	gct Ala	gac Asp 75	cgc Arg	tac Tyr	ata Ile	gat Asp	tta Leu 80	240
agc Ser	aaa Lys	gga Gly	aat Asn	gag Glu 85	gtg Val	tgg Trp	ctt Leu	gta Val	gaa Glu 90	gga Gly	aac Asn	agc Ser	caa Gln	att Ile 95	ttt Phe	288
tat Tyr	aat Asn	gaa Glu	aaa Lys 100	gat Asp	gct Ala	gag Glu	gat Asp	gca Ala 105	gct Ala	aaa Lys	ccc Pro	gct Ala	gta Val 110	agc Ser	aac Asn	336
gct Ala	tat Tyr	tta Leu 115	gat Asp	gct Ala	tca Ser	aac Asn	cag Gln 120	gtg Val	ctg Leu	gtt Val	aaa Lys	ctt Leu 125	agc Ser	cag Gln	ccg Pro	384
tta Leu 130	act Thr	ctt Leu	ggg Gly	gaa Glu	ggc Gly	gca Ala 135	agc Ser	ggc Gly	ttt Phe	acg Thr	gtt Val 140	cat His	gac Asp	gac Asp	aca Thr	432
gca Ala 145	aat Asn	aag Lys	gat Asp	att Ile	cca Pro 150	gtg Val	aca Thr	tct Ser	gtg Val	aag Lys 155	gat Asp	gca Ala	agt Ser	ctt Leu	ggt Gly 160	480
caa Gln	gat Asp	gta Val	acc Thr	gct Ala 165	gtt Val	ttg Leu	gca Ala	ggt Gly	acc Thr 170	ttc Phe	caa Gln	cat His	att Ile	ttt Phe 175	gga Gly	528
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caa Gln	tat Tyr 210	aaa Lys	gtg Val	gct Ala	tta Leu	aat Asn 215	gat Asp	agc Ser	tgg Trp	aat Asn 220	aat Asn	ccg Pro	agt Ser	tac Tyr	cca Pro	672
tct Ser 225	gac Asp	aac Asn	att Ile	aat Asn	tta Leu 230	aca Thr	gtc Val	cct Pro	gcc Ala	ggc Gly 235	ggt Gly	gca Ala	cac His	gtc Val	act Thr 240	720
ttt Phe	tcg Ser	tat Tyr	att Ile	ccg Pro 245	tcc Ser	act Thr	cat His	gca Ala	gtc Val 250	tat Tyr	gac Asp	aca Thr	att Ile	aat Asn 255	aat Asn	768
cct Pro	aat Asn	gcg Ala	gat Asp 260	tta Leu	caa Gln	gta Val	gaa Glu	agc Ser 265	ggg Gly	gtt Val	aaa Lys	acg Thr	gat Asp 270	ctc Leu	gtg Val	816
acg Thr	gtt Val	act Thr 275	cta Leu	ggg Gly	gaa Glu	gat Asp	cca Pro 280	gat Asp	gtg Val	agc Ser	cat His	act Thr 285	ctg Leu	tcc Ser	att Ile	864

caa Gln	aca Thr 290	gat Asp	ggc Gly	tat Tyr	cag Gln	gca Ala 295	aag Lys	cag Gln	gtg Val	ata Ile	cct Pro 300	cgt Arg	aat Asn	gtg Val	ctt Leu	912
aat Asn 305	tca Ser	tca Ser	cag Gln	tac Tyr	tac Tyr 310	tat Tyr	tca Ser	gga Gly	gat Asp	gat Asp 315	ctt Leu	ggg Gly	aat Asn	acc Thr	tat Tyr 320	960
aca Thr	cag Gln	aaa Lys	gca Ala	aca Thr 325	acc Thr	ttt Phe	aaa Lys	gtc Val	tgg Trp 330	gca Ala	cca Pro	act Thr	tct Ser	act Thr 335	caa Gln	1008
gta Val	aat Asn	gtt Val	ctt Leu 340	ctt Leu	tat Tyr	gac Asp	agt Ser	gca Ala 345	acg Thr	ggg Gly	tct Ser	gta Val	aca Thr 350	aaa Lys	atc Ile	1056
gta Val	cct Pro	atg Met 355	acg Thr	gca Ala	tcg Ser	ggc Gly	cat His 360	ggg Gly	gtg Val	tgg Trp	gaa Glu	gca Ala 365	acg Thr	gtt Val	aat Asn	1104
caa Gln	aac Asn 370	ctt Leu	gaa Glu	aat Asn	tgg Trp	tat Tyr 375	tac Tyr	atg Met	tat Tyr	gag Glu	gta Val 380	aca Thr	ggc Gly	caa Gln	ggc Gly	1152
tct Ser 385	acc Thr	cga Arg	acg Thr	gct Ala	gtt Val 390	gat Asp	cct Pro	tat Tyr	gca Ala	act Thr 395	gcg Ala	att Ile	gca Ala	cca Pro	aat Asn 400	1200
gga Gly	acg Thr	aga Arg	ggc Gly	atg Met 405	att Ile	gtg Val	gac Asp	ctg Leu	gct Ala 410	aaa Lys	aca Thr	gat Asp	cct Pro	gct Ala 415	ggc Gly	1248
tgg Trp	aac Asn	agt Ser	gat Asp 420	aaa Lys	cat His	att Ile	acg Thr	cca Pro 425	aag Lys	aat Asn	ata Ile	gaa Glu	gat Asp 430	gag Glu	gtc Val	1296
atc Ile	tat Tyr	gaa Glu 435	atg Met	gat Asp	gtc Val	cgt Arg	gac Asp 440	ttt Phe	tcc Ser	att Ile	gac Asp	cct Pro 445	aat Asn	tcg Ser	ggg Gly	1344
atg Met	aaa Lys 450	aat Asn	aaa Lys	ggg Gly	aag Lys	tat Tyr 455	ttg Leu	gct Ala	ctt Leu	aca Thr	gaa Glu 460	aaa Lys	gga Gly	aca Thr	aag Lys	1392
ggc Gly 465	cct Pro	gac Asp	aac Asn	gta Val	aag Lys 470	acg Thr	ggg Gly	ata Ile	gat Asp	tcc Ser 475	tta Leu	aaa Lys	caa Gln	ctt Leu	ggg Gly 480	1440
att Ile	act Thr	cat His	gtt Val	cag Gln 485	ctt Leu	atg Met	cct Pro	gtt Val	ttc Phe 490	gca Ala	tct Ser	aac Asn	agt Ser	gtc Val 495	gat Asp	1488
gaa Glu	act Thr	gat Asp	cca Pro 500	acc Thr	caa Gln	gat Asp	aat Asn	tgg Trp 505	ggg Gly	tat Tyr	gac Asp	cct Pro	cgc Arg 510	aac Asn	tat Tyr	1536
gat Asp	gtt Val	cct Pro 515	gaa Glu	ggg Gly	cag Gln	tat Tyr	gct Ala 520	aca Thr	aat Asn	gcg Ala	aat Asn	ggg Gly 525	aat Asn	gct Ala	cgt Arg	1584
ata Ile	aaa Lys 530	gag Glu	ttt Phe	aag Lys	gaa Glu	atg Met 535	gtt Val	ctt Leu	tca Ser	ctc Leu	cat His 540	cgt Arg	gaa Glu	cac His	att Ile	1632
ggg Gly 545	gtt Val	aac Asn	atg Met	gat Asp	gtt Val 550	gtc Val	tat Tyr	aat Asn	cat His	acc Thr 555	ttt Phe	gcc Ala	acg Thr	caa Gln	atc Ile 560	1680

tct Ser	gac Asp	ttc Phe	gat Asp	aaa Lys 565	att Ile	gta Val	cca Pro	gaa Glu	tat Tyr 570	tat Tyr	tac Tyr	cgt Arg	acg Thr	gat Asp 575	gat Asp	1728
gca Ala	ggt Gly	aat Asn	tat Tyr 580	acc Thr	aac Asn	gga Gly	tca Ser	ggt Gly 585	act Thr	gga Gly	aat Asn	gaa Glu	att Ile 590	gca Ala	gcc Ala	1776
gaa Glu	agg Arg	cca Pro 595	atg Met	gtt Val	caa Gln	aaa Lys	ttt Phe 600	att Ile	att Ile	gat Asp	tcc Ser	ctt Leu 605	aag Lys	tat Tyr	tgg Trp	1824
gtc Val	aat Asn 610	gag Glu	tat Tyr	cat His	att Ile	gac Asp 615	ggc Gly	ttc Phe	cgt Arg	ttt Phe	gac Asp 620	tta Leu	atg Met	gcg Ala	ctg Leu	1872
ctt Leu 625	gga Gly	aaa Lys	gac Asp	acg Thr	atg Met 630	tcc Ser	aaa Lys	gct Ala	gcc Ala	tcg Ser 635	gag Glu	ctt Leu	cat His	gct Ala	att Ile 640	1920
aat Asn	cca Pro	gga Gly	att Ile	gca Ala 645	ctt Leu	tac Tyr	ggt Gly	gag Glu	cca Pro 650	tgg Trp	acg Thr	ggt Gly	gga Gly	acc Thr 655	tct Ser	1968
gca Ala	ctg Leu	cca Pro	gat Asp 660	gat Asp	cag Gln	ctt Leu	ctg Leu	aca Thr 665	aaa Lys	gga Gly	gct Ala	caa Gln	aaa Lys 670	ggc Gly	atg Met	2016
gga Gly	gta Val	gcg Ala 675	gtg Val	ttt Phe	aat Asn	gac Asp	aat Asn 680	tta Leu	cga Arg	aac Asn	gcg Ala	ttg Leu 685	gac Asp	ggc Gly	aat Asn	2064
gtc Val	ttt Phe 690	gat Asp	tct Ser	tcc Ser	gct Ala	caa Gln 695	ggt Gly	ttt Phe	gcg Ala	aca Thr	ggt Gly 700	gca Ala	aca Thr	ggc Gly	tta Leu	2112
act Thr 705	gat Asp	gca Ala	att Ile	aag Lys	aat Asn 710	ggc Gly	gtt Val	gag Glu	ggg Gly	agt Ser 715	att Ile	aat Asn	gac Asp	ttt Phe	acc Thr 720	2160
tct Ser	tca Ser	cca Pro	ggt Gly	gag Glu 725	aca Thr	att Ile	aac Asn	tat Tyr	gtc Val 730	aca Thr	agt Ser	cat His	gat Asp	aac Asn 735	tac Tyr	2208
acc Thr	ctt Leu	tgg Trp	gac Asp 740	aaa Lys	ata Ile	gcc Ala	cta Leu	agc Ser 745	aat Asn	cct Pro	aat Asn	gat Asp	tcc Ser 750	gaa Glu	gcg Ala	2256
gat Asp	cgg Arg	att Ile 755	aaa Lys	atg Met	gat Asp	gaa Glu	ctc Leu 760	gca Ala	caa Gln	gca Ala	gtt Val	gtt Val 765	atg Met	acc Thr	tca Ser	2304
caa Gln	ggc Gly 770	gtt Val	cca Pro	ttc Phe	atg Met	caa Gln 775	ggc Gly	ggg Gly	gaa Glu	gaa Glu	atg Met 780	ctt Leu	cgt Arg	aca Thr	aaa Lys	2352
ggc Gly 785	ggc Gly	aac Asn	gac Asp	aat Asn	agt Ser 790	tat Tyr	aat Asn	gca Ala	ggc Gly	gat Asp 795	gcg Ala	gtc Val	aat Asn	gag Glu	ttt Phe 800	2400
gat Asp	tgg Trp	agc Ser	agg Arg	aaa Lys 805	gct Ala	caa Gln	tat Tyr	cca Pro	gat Asp 810	gtt Val	ttc Phe	aac Asn	tat Tyr	tat Tyr 815	agc Ser	2448
ggg Gly	cta Leu	atc Ile	cac His 820	ctt Leu	cgt Arg	ctt Leu	gat Asp	cac His 825	cca Pro	gcc Ala	ttc Phe	cgc Arg	atg Met 830	acg Thr	aca Thr	2496

gct aat gaa atc aat agc cac ctc caa ttc cta aat agt cca gag aac 2544  
Ala Asn Glu Ile Asn Ser His Leu Gln Phe Leu Asn Ser Pro Glu Asn  
835 840 845

aca gtg gcc tat gaa tta act gat cat gtt aat aaa gac aaa tgg gga 2592  
Thr Val Ala Tyr Glu Leu Thr Asp His Val Asn Lys Asp Lys Trp Gly  
850 855 860

aat atc att gtt gtt tat aac cca aat aaa act gta gca acc atc aat 2640  
Asn Ile Ile Val Val Tyr Asn Pro Asn Lys Thr Val Ala Thr Ile Asn  
865 870 875 880

ttg ccg agc ggg aaa tgg gca atc aat gct acg agc ggt aag gta gga 2688  
Leu Pro Ser Gly Lys Trp Ala Ile Asn Ala Thr Ser Gly Lys Val Gly  
885 890 895

gaa tcc acc ctt ggt caa gca gag gga agt gtc caa gta cca ggt ata 2736  
Glu Ser Thr Leu Gly Gln Ala Glu Gly Ser Val Gln Val Pro Gly Ile  
900 905 910

tct atg atg atc ctt cat caa gag gta agc cca gac cac ggt aaa aag 2784  
Ser Met Met Ile Leu His Gln Glu Val Ser Pro Asp His Gly Lys Lys  
915 920 925

taa 2787

&lt;210&gt; 4

&lt;211&gt; 928

&lt;212&gt; PRT

&lt;213&gt; Bacillus deramificans

&lt;400&gt; 4

Asp Gly Asn Thr Thr Thr Ile Ile Val His Tyr Phe Arg Pro Ala Gly  
1 5 10 15

Asp Tyr Gln Pro Trp Ser Leu Trp Met Trp Pro Lys Asp Gly Gly Gly  
20 25 30

Ala Glu Tyr Asp Phe Asn Gln Pro Ala Asp Ser Phe Gly Ala Val Ala  
35 40 45

Ser Ala Asp Ile Pro Gly Asn Pro Ser Gln Val Gly Ile Ile Val Arg  
50 55 60

Thr Gln Asp Trp Thr Lys Asp Val Ser Ala Asp Arg Tyr Ile Asp Leu  
65 70 75 80

Ser Lys Gly Asn Glu Val Trp Leu Val Glu Gly Asn Ser Gln Ile Phe  
85 90 95

Tyr Asn Glu Lys Asp Ala Glu Asp Ala Lys Pro Ala Val Ser Asn  
100 105 110

Ala Tyr Leu Asp Ala Ser Asn Gln Val Leu Val Lys Leu Ser Gln Pro

115					120					125					
Leu	Thr	Leu	Gly	Glu	Gly	Ala	Ser	Gly	Phe	Thr	Val	His	Asp	Asp	Thr
	130					135					140				
Ala	Asn	Lys	Asp	Ile	Pro	Val	Thr	Ser	Val	Lys	Asp	Ala	Ser	Leu	Gly
145					150					155					160
Gln	Asp	Val	Thr	Ala	Val	Leu	Ala	Gly	Thr	Phe	Gln	His	Ile	Phe	Gly
				165					170					175	
Gly	Ser	Asp	Trp	Ala	Pro	Asp	Asn	His	Ser	Thr	Leu	Leu	Lys	Lys	Val
			180					185					190		
Thr	Asn	Asn	Leu	Tyr	Gln	Phe	Ser	Gly	Asp	Leu	Pro	Glu	Gly	Asn	Tyr
		195					200					205			
Gln	Tyr	Lys	Val	Ala	Leu	Asn	Asp	Ser	Trp	Asn	Asn	Pro	Ser	Tyr	Pro
	210					215					220				
Ser	Asp	Asn	Ile	Asn	Leu	Thr	Val	Pro	Ala	Gly	Gly	Ala	His	Val	Thr
225					230					235					240
Phe	Ser	Tyr	Ile	Pro	Ser	Thr	His	Ala	Val	Tyr	Asp	Thr	Ile	Asn	Asn
				245					250					255	
Pro	Asn	Ala	Asp	Leu	Gln	Val	Glu	Ser	Gly	Val	Lys	Thr	Asp	Leu	Val
			260					265					270		
Thr	Val	Thr	Leu	Gly	Glu	Asp	Pro	Asp	Val	Ser	His	Thr	Leu	Ser	Ile
		275					280					285			
Gln	Thr	Asp	Gly	Tyr	Gln	Ala	Lys	Gln	Val	Ile	Pro	Arg	Asn	Val	Leu
	290					295					300				
Asn	Ser	Ser	Gln	Tyr	Tyr	Tyr	Ser	Gly	Asp	Asp	Leu	Gly	Asn	Thr	Tyr
305					310					315					320
Thr	Gln	Lys	Ala	Thr	Thr	Phe	Lys	Val	Trp	Ala	Pro	Thr	Ser	Thr	Gln
				325					330					335	
Val	Asn	Val	Leu	Leu	Tyr	Asp	Ser	Ala	Thr	Gly	Ser	Val	Thr	Lys	Ile
			340					345					350		
Val	Pro	Met	Thr	Ala	Ser	Gly	His	Gly	Val	Trp	Glu	Ala	Thr	Val	Asn
		355					360					365			
Gln	Asn	Leu	Glu	Asn	Trp	Tyr	Tyr	Met	Tyr	Glu	Val	Thr	Gly	Gln	Gly
	370					375					380				
Ser	Thr	Arg	Thr	Ala	Val	Asp	Pro	Tyr	Ala	Thr	Ala	Ile	Ala	Pro	Asn

385		390		395		400
Gly Thr Arg Gly	Met 405	Ile Val Asp Leu	Ala 410	Lys Thr Asp Pro	Ala 415	Gly
Trp Asn Ser	Asp 420	Lys His Ile Thr	Pro 425	Lys Asn Ile Glu	Asp 430	Glu Val
Ile Tyr	Glu 435	Met Asp Val Arg	Asp 440	Phe Ser Ile Asp	Pro 445	Asn Ser Gly
Met	Lys 450	Asn Lys Gly Lys	Tyr 455	Leu Ala Leu Thr	Glu 460	Lys Gly Thr Lys
Gly	Pro 465	Asp Asn Val	Lys 470	Thr Gly Ile Asp	Ser 475	Leu Lys Gln Leu Gly
Ile Thr His Val	Gln 485	Leu Met Pro Val	Phe 490	Ala Ser Asn Ser	Val 495	Asp
Glu Thr Asp	Pro 500	Thr Gln Asp Asn	Trp 505	Gly Tyr Asp Pro	Arg 510	Asn Tyr
Asp Val	Pro 515	Glu Gly Gln Tyr	Ala 520	Thr Asn Ala Asn	Gly 525	Asn Ala Arg
Ile	Lys 530	Glu Phe Lys Glu	Met 535	Val Leu Ser Leu	His 540	Arg Glu His Ile
Gly Val	Asn 545	Met Asp Val	Val 550	Tyr Asn His Thr	Phe 555	Ala Thr Gln Ile
Ser Asp Phe Asp	Lys 565	Ile Val Pro Glu	Tyr 570	Tyr Tyr Arg Thr	Asp 575	Asp
Ala Gly Asn Tyr	Thr 580	Asn Gly Ser	Gly 585	Thr Gly Asn Glu	Ile 590	Ala Ala
Glu Arg	Pro 595	Met Val Gln Lys	Phe 600	Ile Ile Asp Ser	Leu 605	Lys Tyr Trp
Val	Asn 610	Glu Tyr His Ile	Asp 615	Gly Phe Arg Phe	Asp 620	Leu Met Ala Leu
Leu	Gly 625	Lys Asp Thr	Met 630	Ser Lys Ala Ala	Ser 635	Glu Leu His Ala Ile
Asn Pro Gly Ile	Ala 645	Leu Tyr Gly Glu	Pro 650	Trp Thr Gly Gly	Thr 655	Ser
Ala Leu Pro Asp Asp	Gln 660	Leu Leu Thr	Lys 665	Gly Ala Gln Lys	Gly 670	Met

660					665					670					
Gly	Val	Ala	Val	Phe	Asn	Asp	Asn	Leu	Arg	Asn	Ala	Leu	Asp	Gly	Asn
		675					680					685			
Val	Phe	Asp	Ser	Ser	Ala	Gln	Gly	Phe	Ala	Thr	Gly	Ala	Thr	Gly	Leu
	690					695					700				
Thr	Asp	Ala	Ile	Lys	Asn	Gly	Val	Glu	Gly	Ser	Ile	Asn	Asp	Phe	Thr
705					710					715					720
Ser	Ser	Pro	Gly	Glu	Thr	Ile	Asn	Tyr	Val	Thr	Ser	His	Asp	Asn	Tyr
				725					730					735	
Thr	Leu	Trp	Asp	Lys	Ile	Ala	Leu	Ser	Asn	Pro	Asn	Asp	Ser	Glu	Ala
			740					745					750		
Asp	Arg	Ile	Lys	Met	Asp	Glu	Leu	Ala	Gln	Ala	Val	Val	Met	Thr	Ser
		755					760					765			
Gln	Gly	Val	Pro	Phe	Met	Gln	Gly	Gly	Glu	Glu	Met	Leu	Arg	Thr	Lys
	770					775					780				
Gly	Gly	Asn	Asp	Asn	Ser	Tyr	Asn	Ala	Gly	Asp	Ala	Val	Asn	Glu	Phe
785					790					795					800
Asp	Trp	Ser	Arg	Lys	Ala	Gln	Tyr	Pro	Asp	Val	Phe	Asn	Tyr	Tyr	Ser
				805					810					815	
Gly	Leu	Ile	His	Leu	Arg	Leu	Asp	His	Pro	Ala	Phe	Arg	Met	Thr	Thr
			820					825					830		
Ala	Asn	Glu	Ile	Asn	Ser	His	Leu	Gln	Phe	Leu	Asn	Ser	Pro	Glu	Asn
		835					840					845			
Thr	Val	Ala	Tyr	Glu	Leu	Thr	Asp	His	Val	Asn	Lys	Asp	Lys	Trp	Gly
	850					855					860				
Asn	Ile	Ile	Val	Val	Tyr	Asn	Pro	Asn	Lys	Thr	Val	Ala	Thr	Ile	Asn
865					870					875					880
Leu	Pro	Ser	Gly	Lys	Trp	Ala	Ile	Asn	Ala	Thr	Ser	Gly	Lys	Val	Gly
				885					890					895	
Glu	Ser	Thr	Leu	Gly	Gln	Ala	Glu	Gly	Ser	Val	Gln	Val	Pro	Gly	Ile
			900					905					910		
Ser	Met	Met	Ile	Leu	His	Gln	Glu	Val	Ser	Pro	Asp	His	Gly	Lys	Lys
		915					920					925			

&lt;210&gt; 5

&lt;211&gt; 2487

&lt;212&gt; DNA

<213> *Bacillus acidopullulyticus*

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)..(2487)

&lt;400&gt; 5

gat tct acc tcg aca gaa gtc att gtg cat tat cat cgt ttt gat tct	48
Asp Ser Thr Ser Thr Glu Val Ile Val His Tyr His Arg Phe Asp Ser	
1 5 10 15	
aac tat gca aat tgg gat cta tgg atg tgg cca tat caa cca gtt aat	96
Asn Tyr Ala Asn Trp Asp Leu Trp Met Trp Pro Tyr Gln Pro Val Asn	
20 25 30	
ggt aat gga gca gca tac gag ttt tct gga aag gat gat ttt ggc gtt	144
Gly Asn Gly Ala Ala Tyr Glu Phe Ser Gly Lys Asp Asp Phe Gly Val	
35 40 45	
aaa gca gat gtt caa gtg cct ggg gat gat aca cag gta ggt ctg att	192
Lys Ala Asp Val Gln Val Pro Gly Asp Asp Thr Gln Val Gly Leu Ile	
50 55 60	
gtc cgt aca aat gat tgg agc caa aaa aat aca tca gac gat ctc cat	240
Val Arg Thr Asn Asp Trp Ser Gln Lys Asn Thr Ser Asp Asp Leu His	
65 70 75 80	
att gat ctg aca aag ggg cat gaa ata tgg att gtt cag ggg gat ccc	288
Ile Asp Leu Thr Lys Gly His Glu Ile Trp Ile Val Gln Gly Asp Pro	
85 90 95	
aat att tat tac aat ctg agt gat gcg cag gct gca gcg act cca aag	336
Asn Ile Tyr Tyr Asn Leu Ser Asp Ala Gln Ala Ala Ala Thr Pro Lys	
100 105 110	
gtt tcg aat gcg tat ttg gat aat gaa aaa aca gta ttg gca aag cta	384
Val Ser Asn Ala Tyr Leu Asp Asn Glu Lys Thr Val Leu Ala Lys Leu	
115 120 125	
act aat cca atg aca tta tca gat gga tca agc ggc ttt acg gtt aca	432
Thr Asn Pro Met Thr Leu Ser Asp Gly Ser Ser Gly Phe Thr Val Thr	
130 135 140	
gat aaa aca aca ggg gaa caa att cca gtt acc gct gca aca aat gcg	480
Asp Lys Thr Thr Gly Glu Gln Ile Pro Val Thr Ala Ala Thr Asn Ala	
145 150 155 160	
aac tca gcc tcc tcg tct gag cag aca gac ttg gtt caa ttg acg tta	528
Asn Ser Ala Ser Ser Glu Gln Thr Asp Leu Val Gln Leu Thr Leu	
165 170 175	
gcc agt gca ccg gat gtt tcc cat aca ata caa gta gga gca gcc ggt	576
Ala Ser Ala Pro Asp Val Ser His Thr Ile Gln Val Gly Ala Ala Gly	
180 185 190	
tat gaa gca gtc aat ctc ata cca cga aat gta tta aat ttg cct cgt	624
Tyr Glu Ala Val Asn Leu Ile Pro Arg Asn Val Leu Asn Leu Pro Arg	

195				200				205								
tat	tat	tac	agc	gga	aat	gat	tta	ggt	aac	gtt	tat	tca	aat	aag	gca	672
Tyr	Tyr	Tyr	Ser	Gly	Asn	Asp	Leu	Gly	Asn	Val	Tyr	Ser	Asn	Lys	Ala	
	210					215					220					
acg	gcc	ttc	cgt	gta	tgg	gct	cca	act	gct	tcg	gat	gtc	caa	tta	ctt	720
Thr	Ala	Phe	Arg	Val	Trp	Ala	Pro	Thr	Ala	Ser	Asp	Val	Gln	Leu	Leu	
225					230					235					240	
tta	tac	aat	agt	gaa	aca	gga	cct	gta	acc	aaa	cag	ctt	gaa	atg	caa	768
Leu	Tyr	Asn	Ser	Glu	Thr	Gly	Pro	Val	Thr	Lys	Gln	Leu	Glu	Met	Gln	
				245					250					255		
aag	agt	gat	aac	ggg	aca	tgg	aaa	ctg	aag	gtc	cct	ggg	aat	ctg	aaa	816
Lys	Ser	Asp	Asn	Gly	Thr	Trp	Lys	Leu	Lys	Val	Pro	Gly	Asn	Leu	Lys	
			260					265					270			
aat	tgg	tat	tat	ctc	tat	cag	gta	acg	gtg	aat	ggg	aag	aca	caa	aca	864
Asn	Trp	Tyr	Tyr	Leu	Tyr	Gln	Val	Thr	Val	Asn	Gly	Lys	Thr	Gln	Thr	
		275					280					285				
gcc	gtt	gac	cct	tat	gtg	cgt	gct	att	tca	gtc	aat	gca	aca	cgt	ggg	912
Ala	Val	Asp	Pro	Tyr	Val	Arg	Ala	Ile	Ser	Val	Asn	Ala	Thr	Arg	Gly	
	290					295					300					
atg	ata	gtc	gat	tta	gaa	gat	acg	aat	cct	cct	gga	tgg	aaa	gaa	gat	960
Met	Ile	Val	Asp	Leu	Glu	Asp	Thr	Asn	Pro	Pro	Gly	Trp	Lys	Glu	Asp	
305					310					315					320	
cat	caa	cag	aca	cct	gcg	aac	cca	gtg	gat	gaa	gta	atc	tac	gaa	gtg	1008
His	Gln	Gln	Thr	Pro	Ala	Asn	Pro	Val	Asp	Glu	Val	Ile	Tyr	Glu	Val	
				325					330					335		
cat	gtg	cgt	gat	ttt	tcg	att	gat	gct	aat	tca	ggc	atg	aaa	aat	aaa	1056
His	Val	Arg	Asp	Phe	Ser	Ile	Asp	Ala	Asn	Ser	Gly	Met	Lys	Asn	Lys	
			340					345					350			
ggg	aaa	tat	ctt	gcc	ttt	aca	gaa	cat	ggc	aca	aaa	ggc	cct	gat	aac	1104
Gly	Lys	Tyr	Leu	Ala	Phe	Thr	Glu	His	Gly	Thr	Lys	Gly	Pro	Asp	Asn	
		355					360					365				
gtg	aaa	acg	ggg	att	gat	agt	ttg	aag	gaa	tta	gga	atc	aat	gct	gtt	1152
Val	Lys	Thr	Gly	Ile	Asp	Ser	Leu	Lys	Glu	Leu	Gly	Ile	Asn	Ala	Val	
	370					375					380					
caa	tta	cag	ccg	att	gaa	gaa	ttt	aac	agc	att	gat	gaa	acc	caa	cca	1200
Gln	Leu	Gln	Pro	Ile	Glu	Glu	Phe	Asn	Ser	Ile	Asp	Glu	Thr	Gln	Pro	
385					390					395					400	
aat	atg	tat	aac	tgg	ggc	tat	gac	cca	aga	aac	tac	aac	gtc	cct	gaa	1248
Asn	Met	Tyr	Asn	Trp	Gly	Tyr	Asp	Pro	Arg	Asn	Tyr	Asn	Val	Pro	Glu	
				405					410					415		
gga	gcg	tat	gca	act	aca	cca	gaa	gga	acg	gct	cgc	att	acc	cag	tta	1296
Gly	Ala	Tyr	Ala	Thr	Thr	Pro	Glu	Gly	Thr	Ala	Arg	Ile	Thr	Gln	Leu	
			420					425					430			
aag	caa	ctg	att	caa	agc	att	cat	aaa	gat	cgg	att	gct	atc	aat	atg	1344
Lys	Gln	Leu	Ile	Gln	Ser	Ile	His	Lys	Asp	Arg	Ile	Ala	Ile	Asn	Met	
		435					440					445				
gat	gtg	gtc	tat	aac	cat	acc	ttt	aac	gta	gga	gtg	tct	gat	ttt	gat	1392
Asp	Val	Val	Tyr	Asn	His	Thr	Phe	Asn	Val	Gly	Val	Ser	Asp	Phe	Asp	
	450					455					460					
aag	att	gtt	ccg	caa	tac	tat	tat	cgg	aca	gac	agc	gca	ggg	aat	tat	1440
Lys	Ile	Val	Pro	Gln	Tyr	Tyr	Tyr	Arg	Thr	Asp	Ser	Ala	Gly	Asn	Tyr	

465	470					475					480					
acg Thr	aac Asn	ggc Gly	tca Ser	ggt Gly 485	gta Val	ggt Gly	aat Asn	gaa Glu	att Ile 490	gcg Ala	acc Thr	gag Glu	cgt Arg	ccg Pro 495	atg Met	1488
gtc Val	caa Gln	aag Lys	ttc Phe 500	gtt Val	ctg Leu	gat Asp	tct Ser	ggt Val 505	aaa Lys	tat Tyr	tgg Trp	gta Val	aag Lys 510	gaa Glu	tac Tyr	1536
cat His	atc Ile	gac Asp 515	ggc Gly	ttc Phe	cgt Arg	ttc Phe	gat Asp 520	ctt Leu	atg Met	gct Ala	ctt Leu	tta Leu 525	gga Gly	aaa Lys	gac Asp	1584
acc Thr	atg Met 530	gcc Ala	aaa Lys	ata Ile	tca Ser	aaa Lys 535	gag Glu	ctt Leu	cat His	gct Ala	att Ile 540	aat Asn	cct Pro	ggc Gly	att Ile	1632
gtc Val 545	ctg Leu	tat Tyr	gga Gly	gaa Glu	cca Pro 550	tgg Trp	act Thr	ggc Gly	ggt Gly	acc Thr 555	tct Ser	gga Gly	tta Leu	tca Ser	agc Ser 560	1680
gac Asp	caa Gln	ctc Leu	gtt Val 565	acg Thr	aaa Lys	ggt Gly	cag Gln	caa Gln	aag Lys 570	ggc Gly	ttg Leu	gga Gly	att Ile	ggc Gly 575	gta Val	1728
ttc Phe	aac Asn	gat Asp 580	aat Asn	att Ile	cgg Arg	aac Asn	gga Gly	ctc Leu 585	gat Asp	ggt Gly	aac Asn	gtt Val	ttt Phe 590	gat Asp	aaa Lys	1776
tcg Ser	gca Ala	caa Gln 595	gga Gly	ttt Phe	gca Ala	aca Thr	gga Gly 600	gat Asp	cca Pro	aac Asn	caa Gln	gtt Val 605	aat Asn	gtc Val	att Ile	1824
aaa Lys	aat Asn 610	aga Arg	gtt Val	atg Met	gga Gly	agt Ser 615	att Ile	tca Ser	gat Asp	ttc Phe	act Thr 620	tcg Ser	gca Ala	cct Pro	agc Ser	1872
gaa Glu 625	acc Thr	att Ile	aac Asn	tat Tyr	gta Val 630	aca Thr	agc Ser	cat His	gat Asp	aat Asn 635	atg Met	aca Thr	ttg Leu	tgg Trp	gat Asp 640	1920
aaa Lys	att Ile	agc Ser	gca Ala	agt Ser 645	aat Asn	ccg Pro	aac Asn	gat Asp	aca Thr 650	caa Gln	gca Ala	gat Asp	cga Arg	att Ile 655	aag Lys	1968
atg Met	gat Asp	gaa Glu 660	ttg Leu	gct Ala	caa Gln	gct Ala	gtg Val	gta Val 665	ttt Phe	act Thr	tca Ser	caa Gln	ggg Gly 670	gta Val	cca Pro	2016
ttt Phe	atg Met 675	caa Gln	ggt Gly	gga Gly	gaa Glu	gaa Glu	atg Met 680	ctg Leu	cgg Arg	aca Thr	aaa Lys	ggc Gly 685	ggt Gly	aat Asn	gat Asp	2064
aat Asn	agt Ser 690	tac Tyr	aat Asn	gcc Ala	ggg Gly	gat Asp 695	agc Ser	gtg Val	aat Asn	cag Gln	ttc Phe 700	gat Asp	tgg Trp	tca Ser	aga Arg	2112
aaa Lys 705	gca Ala	caa Gln	ttt Phe	gaa Glu	aat Asn 710	gta Val	ttc Phe	gac Asp	tac Tyr 715	tct Ser	tgg Trp	ttg Leu	att Ile	cat His 720		2160
cta Leu	cgt Arg	gat Asp	aat Asn	cac His 725	cca Pro	gca Ala	ttc Phe	cgt Arg	atg Met 730	acg Thr	aca Thr	gcg Ala	gat Asp	caa Gln 735	atc Ile	2208
aaa Lys	caa Gln	aat Asn	ctc Leu	act Thr	ttc Phe	ttg Leu	gat Asp	agc Ser	cca Pro	acg Thr	aac Asn	act Thr	gta Val	gca Ala	ttt Phe	2256

740					745					750						
gaa	tta	aaa	aat	cat	gcc	aat	cat	gat	aaa	tgg	aaa	aac	att	ata	gtt	2304
Glu	Leu	Lys	Asn	His	Ala	Asn	His	Asp	Lys	Trp	Lys	Asn	Ile	Ile	Val	
		755					760					765				
atg	tat	aat	cca	aat	aaa	act	gca	caa	act	ctc	act	cta	cca	agt	gga	2352
Met	Tyr	Asn	Pro	Asn	Lys	Thr	Ala	Gln	Thr	Leu	Thr	Leu	Pro	Ser	Gly	
	770					775					780					
aat	tgg	aca	att	gta	gga	tta	ggc	aat	caa	gta	ggg	gag	aaa	tca	cta	2400
Asn	Trp	Thr	Ile	Val	Gly	Leu	Gly	Asn	Gln	Val	Gly	Glu	Lys	Ser	Leu	
	785				790					795					800	
ggc	cat	gta	aat	ggc	acg	gtt	gag	gtg	cca	gct	ctt	agt	acg	atc	att	2448
Gly	His	Val	Asn	Gly	Thr	Val	Glu	Val	Pro	Ala	Leu	Ser	Thr	Ile	Ile	
				805					810					815		
ctt	cat	cag	ggg	aca	tct	gaa	gat	gtc	att	gat	caa	aat				2487
Leu	His	Gln	Gly	Thr	Ser	Glu	Asp	Val	Ile	Asp	Gln	Asn				
			820					825								

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&lt;211&gt; 829

&lt;212&gt; PRT

&lt;213&gt; Bacillus acidopullulyticus

&lt;400&gt; 6

Asp Ser Thr Ser Thr Glu Val Ile Val His Tyr His Arg Phe Asp Ser  
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Asn Tyr Ala Asn Trp Asp Leu Trp Met Trp Pro Tyr Gln Pro Val Asn  
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Gly Asn Gly Ala Ala Tyr Glu Phe Ser Gly Lys Asp Asp Phe Gly Val  
 35 40 45

Lys Ala Asp Val Gln Val Pro Gly Asp Asp Thr Gln Val Gly Leu Ile  
 50 55 60

Val Arg Thr Asn Asp Trp Ser Gln Lys Asn Thr Ser Asp Asp Leu His  
 65 70 75 80

Ile Asp Leu Thr Lys Gly His Glu Ile Trp Ile Val Gln Gly Asp Pro  
 85 90 95

Asn Ile Tyr Tyr Asn Leu Ser Asp Ala Gln Ala Ala Ala Thr Pro Lys  
 100 105 110

Val Ser Asn Ala Tyr Leu Asp Asn Glu Lys Thr Val Leu Ala Lys Leu  
 115 120 125

Thr Asn Pro Met Thr Leu Ser Asp Gly Ser Ser Gly Phe Thr Val Thr

130	135	140
Asp 145	Lys Thr Thr Gly 150	Gln Ile Pro Val Thr 155
Ala Thr Asn Ala 160		
Asn Ser Ala Ser 165	Ser Glu Gln Thr Asp 170	Leu Val Gln Leu Thr 175
Ala Ser Ala Pro 180	Asp Val Ser His Thr 185	Ile Gln Val Gly Ala Ala Gly 190
Tyr Glu Ala 195	Val Asn Leu Ile Pro 200	Arg Asn Val Leu Asn 205
Leu Pro Arg		
Tyr Tyr 210	Tyr Ser Gly Asn Asp 215	Leu Gly Asn Val Tyr 220
Ser Asn Lys Ala		
Thr 225	Ala Phe Arg Val Trp 230	Ala Pro Thr Ala Ser 235
Asp Val Gln Leu Leu 240		
Leu Tyr Asn Ser 245	Glu Thr Gly Pro Val Thr 250	Lys Gln Leu Glu Met 255
Gln		
Lys Ser Asp Asn 260	Gly Thr Trp Lys Leu 265	Lys Val Pro Gly Asn 270
Leu Lys		
Asn Trp Tyr 275	Tyr Leu Tyr Gln Val 280	Thr Val Asn Gly Lys 285
Thr Gln Thr		
Ala Val 290	Asp Pro Tyr Val Arg 295	Ala Ile Ser Val Asn 300
Ala Thr Arg Gly		
Met 305	Ile Val Asp Leu Glu 310	Asp Thr Asn Pro Pro 315
Gly Trp Lys Glu Asp 320		
His Gln Gln Thr 325	Pro Ala Asn Pro Val Asp 330	Glu Val Ile Tyr Glu 335
Val		
His Val Arg Asp 340	Phe Ser Ile Asp Ala 345	Asn Ser Gly Met Lys 350
Asn Lys		
Gly Lys Tyr 355	Leu Ala Phe Thr Glu 360	His Gly Thr Lys Gly 365
Pro Asp Asn		
Val Lys Thr Gly Ile Asp 370	Ser Leu Lys Glu Leu Gly 380	Ile Asn Ala Val
Gln Leu Gln Pro Ile 385	Glu Glu Phe Asn Ser Ile 395	Asp Glu Thr Gln Pro 400
Asn Met Tyr Asn Trp Gly Tyr Asp Pro Arg Asn Tyr Asn Val Pro Glu		

405								410				415			
Gly	Ala	Tyr	Ala 420	Thr	Thr	Pro	Glu	Gly 425	Thr	Ala	Arg	Ile	Thr 430	Gln	Leu
Lys	Gln	Leu 435	Ile	Gln	Ser	Ile	His 440	Lys	Asp	Arg	Ile	Ala 445	Ile	Asn	Met
Asp	Val 450	Val	Tyr	Asn	His	Thr 455	Phe	Asn	Val	Gly	Val 460	Ser	Asp	Phe	Asp
Lys 465	Ile	Val	Pro	Gln	Tyr 470	Tyr	Tyr	Arg	Thr	Asp 475	Ser	Ala	Gly	Asn	Tyr 480
Thr	Asn	Gly	Ser	Gly 485	Val	Gly	Asn	Glu	Ile 490	Ala	Thr	Glu	Arg	Pro 495	Met
Val	Gln	Lys	Phe 500	Val	Leu	Asp	Ser	Val 505	Lys	Tyr	Trp	Val	Lys 510	Glu	Tyr
His	Ile	Asp 515	Gly	Phe	Arg	Phe	Asp 520	Leu	Met	Ala	Leu	Leu 525	Gly	Lys	Asp
Thr	Met 530	Ala	Lys	Ile	Ser	Lys 535	Glu	Leu	His	Ala	Ile 540	Asn	Pro	Gly	Ile
Val 545	Leu	Tyr	Gly	Glu	Pro 550	Trp	Thr	Gly	Gly	Thr 555	Ser	Gly	Leu	Ser	Ser 560
Asp	Gln	Leu	Val	Thr 565	Lys	Gly	Gln	Gln	Lys 570	Gly	Leu	Gly	Ile	Gly 575	Val
Phe	Asn	Asp	Asn 580	Ile	Arg	Asn	Gly	Leu 585	Asp	Gly	Asn	Val	Phe 590	Asp	Lys
Ser	Ala	Gln 595	Gly	Phe	Ala	Thr	Gly 600	Asp	Pro	Asn	Gln	Val 605	Asn	Val	Ile
Lys	Asn 610	Arg	Val	Met	Gly	Ser 615	Ile	Ser	Asp	Phe	Thr 620	Ser	Ala	Pro	Ser
Glu 625	Thr	Ile	Asn	Tyr	Val 630	Thr	Ser	His	Asp	Asn 635	Met	Thr	Leu	Trp	Asp 640
Lys	Ile	Ser	Ala	Ser 645	Asn	Pro	Asn	Asp	Thr 650	Gln	Ala	Asp	Arg	Ile 655	Lys
Met	Asp	Glu	Leu 660	Ala	Gln	Ala	Val	Val 665	Phe	Thr	Ser	Gln	Gly 670	Val	Pro
Phe	Met	Gln	Gly	Gly	Glu	Glu	Met	Leu	Arg	Thr	Lys	Gly	Gly	Asn	Asp

675                      680                      685  
 Asn Ser Tyr Asn Ala Gly Asp Ser Val Asn Gln Phe Asp Trp Ser Arg  
 690                      695                      700  
 Lys Ala Gln Phe Glu Asn Val Phe Asp Tyr Tyr Ser Trp Leu Ile His  
 705                      710                      715                      720  
 Leu Arg Asp Asn His Pro Ala Phe Arg Met Thr Thr Ala Asp Gln Ile  
 725                      730                      735  
 Lys Gln Asn Leu Thr Phe Leu Asp Ser Pro Thr Asn Thr Val Ala Phe  
 740                      745                      750  
 Glu Leu Lys Asn His Ala Asn His Asp Lys Trp Lys Asn Ile Ile Val  
 755                      760                      765  
 Met Tyr Asn Pro Asn Lys Thr Ala Gln Thr Leu Thr Leu Pro Ser Gly  
 770                      775                      780  
 Asn Trp Thr Ile Val Gly Leu Gly Asn Gln Val Gly Glu Lys Ser Leu  
 785                      790                      795                      800  
 Gly His Val Asn Gly Thr Val Glu Val Pro Ala Leu Ser Thr Ile Ile  
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